the phenomena of meteorological optics had, I believe, been worked out by Babinet about ten years earlier.

As to the vertical pillar of light frequently observed in high latitudes after sunset and before sunrise, and occasionally seen in latitudes as low as ours, it may be attributed to spiculæ of ice which, whether isolated or radiating from a centre as in crystals of snow, will assume a horizontal position if they subside through a portion of the atmosphere which is quite free from convection currents. Those of the horizontal spiculæ which are vertically over the cone connecting the spectator's eye and the sun will include some that can directly reflect solar light to his eye, and it is these that produce the phenomenon which was seen by Mr. Knight. The pillar may be expected to be white till the sun gets some distance below the horizon, when it will in succession assume the colours due to the absorption and dispersion of light by the atmosphere.

It can easily be shown experimentally that if the air be free from the minute convection currents which so trouble astronomers (which it seldom is), then subsiding spiculæ of ice will be horizontal. To show this, cut from a sheet of stiff paper a straight, long and narrow strip, and let it fall through the air. The experiment is a pretty one when the strip of paper is thrown out of an upper window on a calm day. The strip falls not lengthwise, but sideways, and spins round its long horizontal axis. The dynamics of this phenomenon have not, I think, as yet been worked out. The explanation would require an investigation of the stream lines surrounding a body rotating as well as progressing through a fluid. It seems to be a problem which might with advantage be proposed to the mathematical research scholars of our Universities.

30 Ledbury Road, W., March 16. G. JOHNSTONE STONEY.

Proofs of Euclid I. 5.

BESIDES the proofs cited by Prof. Bryan (p. 438), another is equally worthy of notice, and requires no construction. The sides of the triangle ABC may be regarded as taken in two orders—

$$\begin{aligned} &AB, AC \text{ and } \angle A \\ &= AC, AB \text{ and } \angle A \\ &\therefore \angle \text{ opp. } AB = \angle \text{ opp. } AC. \end{aligned}$$

This is a variation of the proof by duplication, but avoids this process. As in the case of the proof cited by Prof. Bryan and involving limiting values, the proof given above is not altogether satisfactory for the use of beginners, and is, of course, of no value to the advancing student except as an interesting illustration of method. H. W. CROOME SMITH.

Bristol, March 15.

As Prof. Bryan is discussing proofs of Euclid's I. 5, may I call attention to the way I proved it in my "Foundations of Geometry," namely as a corollary to the equivalent of I. 4? Thus—

"For if AB in the above proof had been equal to AC, the triangle ABC might also have been moved so that AB fell on DF, and AC on DE, and the triangles would have been congruent so. Hence both the angles ABC and ACB would be shown to be equal to DEF, and therefore to each other."

This seems to me far and away simpler than any other proof I know of, and it has the advantage of directing attention to the fact that the proof of I. 4 as often as not involves turning the triangle over in the air, while moving it; so that, for example, the proof would not apply as it stands to spherical triangles. EDWARD T. DIXON.

Racketts, Hythe, Hants, March 16.

THE NATIONAL PHYSICAL LABORATORY.

SOME further account of the National Physical Laboratory, which is being opened by H.R.H. the Prince of Wales, accompanied by H.R.H. the Princess, as these lines go to press, may be of interest to readers of NATURE. A description of Bushy House, with plans, has already appeared; the alterations required to fit it or a laboratory are now complete, and the new buildngs erected for the engineering department are ready or use. The following extracts from the report of the executive committee will indicate what has been done :—

The basement and ground floor of Bushy House have been transformed into a physical laboratory, while the upper floors form offices and a residence for the director. The basement is covered with a brick groining, on which the main building rests, but the more important laboratories are in four large wings, one at each corner, and these have no basement below, thus steady supports are everywhere possible.

One wing, containing the original dining-room and library, has been fitted as an electrical and magnetic laboratory. All iron has been, as far as possible, removed from the structure, and, with a view of preventing a stray magnetic field from any currents which may be used, concentric wiring has been employed for all large currents, while the wires for smaller currents have been twisted.

In this room will be placed the Lorenz apparatus which the Drapers' Company has recently with great generosity given to the Laboratory in memory of the distinguished services to science and to education of the late Principal J. V. Jones, F.R.S., of Cardiff. Along with this there will be other apparatus for the absolute measurement of current and of electromotive force.

Another wing has been fitted for thermometric work. A special study will be made of high-temperature thermometers, and the laboratory owes to the generosity of Sir A. Noble the means for installing a number of electric ovens for testing thermopiles and other instruments for the measurement of temperature up to 1000° or 1200° Centigrade.

In a third wing a metallurgical laboratory has been fitted in which to continue the work begun at the Mint by Sir William Roberts-Austen and the Alloys Research Committee. For this purpose apparatus for cutting and polishing sections and further photomicrographical examination has been obtained. The committee has to thank Mr. Stead for his assistance in arranging this. The fourth wing is fitted as a chemical laboratory. In the basement are a number of constant temperature rooms.

Sir Andrew Noble's fund, referred to in the last report, has provided a measuring machine, a dividing engine and a comparator, which will be placed in some of the basement rooms. In an adjoining room the resistance measurements of the British Association Committee will be continued, while in another, apparatus for the production of liquid air is being set up. The testing of pressure gauges will form an important branch of the work, and for this a mercury column some fifty feet in height has been erected in one corner of the house.

Gas and water have been laid on freely throughout the building—also electricity. A 100-volt circuit is connected to the main dynamo and battery in the power-house, and supplies light. Numerous plug points enable a supply to be taken off for lights for experimental purposes or for small motors. For experimental work a special battery of fifty-five cells has been installed. This is divided into groups of five. Wires run from the switch-board to the various rooms in such a way that one or more of these groups can be switched on to any circuit. Thus voltages between 2 and 110 volts can be obtained as required.

The house is heated on the Webster low-pressure system by steam from a Lancashire boiler in the boiler-house at a distance of about 100 yards. The boiler also supplies steam to one of Parson's 60-kilowatt turbo-generators, which is the main source of power. The power-house also contains an 18-h.p. Crossley gas-engine, driving a 12-kilowatt dynamo by T. Parker and Co. This serves as a stand-by and for charging the main battery of fifty-eight chloride cells.

The engineering laboratory, a building eighty feet by fifty feet, adjoins the power-house. This is divided into two bays; a shaft, driven by a motor supplied by Mather

and Platt, runs along one, and in it will be placed the lathes, drilling machine, planing machine and other tools. The other bay is for experimental work. It is traversed by a 2-ton crane, and will contain a testing machine and machinery for testing steam-pressure gauges, indicators and such instruments.

With regard to gifts to the Laboratory, it has already been mentioned that the Drapers' Company has undertaken to provide the sum of 700*l.* to meet the cost of a Lorenz apparatus, in memory of the late Principal Viriamu Jones. Messrs. Willans and Robinson are providing apparatus for testing steam-pressure gauges and indicators, while in a number of cases very advantageous terms have been granted to the committee by manufacturers of tools and machinery. Lord Rayleigh, Lord Kelvin, Mrs. Hopkinson, and the Syndics of the Cambridge University Press have presented valuable books. Lady Galton has given a valuable astronomical clock with electric contacts, in memory of the late Sir Douglas Galton.

But though much has been done, the Laboratory is far from complete. Rather more than 3000*l.* has been spent on apparatus, but visitors will notice many gaps before the important problems which lie to hand can be fully grasped. Still, it is now possible to make a start, and to show, by the work done with the means at the disposal of the staff, that the Laboratory is fulfilling a need and that it deserves the support of those who are concerned in facilitating the application of science to industry. The pious benefactor, however, who will put it as regards equipment on a footing comparable with the Reichsanstalt is still to seek.

In research work it is hoped that the investigations of the Alloys Research Committee may be continued. Much, though not all, of the apparatus required for this has been purchased; a recording pyrometer, however, must be added to the outfit before it is complete. Prof. Barrett's paper read at the Institution of Electrical Engineers recently showed the importance of the aluminium steels for dynamo and transformer manufactures, and with the kind assistance he then offered it is hoped that a start may soon be made on their investigation.

The measurement of wind pressure is of great importance to engineers; with the help of Sir Benjamin Baker, an investigation will be made into this subject.

In thermometry, the object will be to arrange for the more systematic and ready measurement of the high temperatures met with in industrial undertakings.

As to the commercial testing work which is to be undertaken, the following list will indicate its scope, though until the Laboratory standards have been more thoroughly studied it is hardly possible to do much on a large scale:—

Tests of pressure gauges and steam indicators.

Tests of measuring appliances and gauges for use in engineering shops, &c.

Test of screw gauges.

Tests of thermometers for the measurement of high or low temperature, the platinum thermometer, thermopiles, &c.

Photomicrographic tests on metals, steel rails, &c.

Measurement of the insulation resistance and dielectric capacity of insulators.

Measurement of the electrical resistance of conductors.

Tests of capacity and induction and of various forms of electrical measuring apparatus.

Tests on the magnetic properties of iron, &c.

Standardisation of glass vessels, flasks, burettes, &c., used in chemical laboratories and in various industries—*e.g.* the dairy trade.

Standardisation of weights and scales for laboratory purposes.

Testing of photographic and other lenses.

The director hopes before long to issue a pamphlet giving some account of these various tests, together with a statement of fees charged.

Thus an ample programme has been prepared, and it is interesting to learn on the authority of the director that some slight demand has already shown itself for nearly all the tests enumerated in the list.

PROPOSED ORGANISED RESEARCH ON CANCER.

WE are pleased to learn that a scheme has recently been elaborated in this country for the purpose of systematising and procuring endowment for research upon cancer. In this respect our country is already somewhat behindhand, since a similar organisation has been for some time in full activity in Germany. A large sum of money has been placed at the disposal of Prof. Ehrlich, and a German cancer committee, with Prof. von Leyden as president, is now at work. To this purpose the German Government has already made grants of upwards of 50,000 marks. In America there is a State-subsidised cancer laboratory at the present time, under the direction of Prof. Roswell Park, concerning the work of which some account was given in the *Medical Record* last May. In France, cooperative work upon cancer is also already in progress, a special journal being devoted to the publication of the results.

It will be unnecessary to enter here into the details of the scheme; suffice it to say that any funds will be invested in the names of five trustees, and that the income derived from them will be paid over to a general committee consisting of these trustees and three representatives of the College of Physicians (the president and two censors), three representatives of the College of Surgeons (the president and two vice-presidents), the members of the laboratories committee of the Royal Colleges of Physicians and Surgeons, and one member, to be nominated by the Local Government Board. The general committee will have control of the income of the fund, but concerning the exact method of spending it they will take counsel with an advisory board, which will consist of the laboratories committee of the Royal Colleges and other members chosen in equal numbers by each of the Royal Colleges. It is estimated that the sum of 100,000*l.* will be required for the above purpose. At the present time, funds are conspicuous by their absence.

To the lay mind the term cancer does not imply a well-marked entity; the word is, in fact, occasionally used as synonymous with tumour, meaning, roughly, a swelling or growth where a swelling or growth ought not to be. To the medical mind the term cancer means a special form of tumour which is characterised microscopically by its structure and clinically by its method of growth. This latter is of two kinds, local and general. The local growth consists of an infiltration of the adjacent tissues, the general growth of a dissemination of the particles of the disease which produce growths, conforming in type to the original tumour, in parts of the body more or less remote from the seat of the primary affection. So far as concerns their minute structure, however, tumours growing in the above manner are not all, from the histological standpoint, cancers or carcinomatous. This term has been made by morbid histologists conventionally to designate a definite variety of tumours growing in the above-stated "malignant" manner, viz. those the microscopic structure of which is of the epiblastic or epithelial type. This classification is rendered necessary by the fact that there exists another class of tumours equally malignant, but the minute structure of which is of the connective-tissue or mesoblastic type. These tumours